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Towards Sustainable Industrial Development - A Systems Thinking-Based Approach

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Abstract

Various critical global issues, including global warming and poverty, have been recognized and identified by the United Nations (UN) as drivers for unsustainability. Consequently, the UN established the Sustainable Development Goals (SDGs) with the aim of seeking universal peace and larger freedom by balancing the three dimensions of sustainable development, i.e. economic, social and environmental. A particular attention SDGs pay is in eradicating poverty as this is considered one of the greatest global challenges. Poverty is not only an economic matter as it also has an impact on the social and environmental dimensions. A strategy to tackle poverty is to foster industry development. However, a holistic point of view is necessary by also considering stakeholders otherwise, it becomes a neoliberal solution. Despite the fact that some research has been conducted, e.g. case studies and surveys of sustainable practices, there is a lack of industrial sustainable development as a framework to tackle sustainability issues. Thus, this paper proposes a framework for industrial sustainable development under a socially inclusive approach within the context of the Mexican manufacturing industry. The framework proposal is based on a state-of-the-art literature review conducted in the Web of Science and Scopus databases.

Keywords
Sustainable and social inclusive Development, Systems Thinking, Industrial Strategy, Manufacturing Cluster, SMEs.

1. Introduction

One of the issues that currently has become a central axis for the United Nations (UN) as well as for developing and developed nations is sustainability. In September 2015, world leaders attended the United Nations Summit and signed the document entitled '*Transforming Our World: the 2030 Agenda for Sustainable Development*'. It includes the 17 Sustainable Development Goals (SDGs), which have the objective of putting an end to poverty, fights against inequality and copes with climate change, without anyone falling behind (United Nations, 2015). SDGs are goals for sustainable development. Although poverty is one of the biggest world issues, there are strategies for tackling it, e.g. industrial development. Two objectives align to industrial sustainability, i.e. SDGs 8 and 9. SDGs 8 relates to decent work and economic growth, whereas SDGs 9 refers to industry innovation and infrastructure. Both goals contribute to endogenous sustainability, but they would have an exogenous effect on the 15 remaining ones.

However, how industrialization can contribute to sustainability is explained by Porter in his research '*Green and Competitive: Ending the Stalemate'*, which suggests that properly designed environmental regulations could trigger innovation that uses resources productively. This would lower the total cost of products or services, which gives competitive advantage (Pacheco-Vega, 2007; Porter, 1995) as opposed to those firms who are not willing to innovate and thus may have regulations fulfillment struggles (Porter, 1995). Therefore, the absence of an industrialization strategy from the state results in inefficient productivity performance. According to Porter (1998), productivity determines the prosperity of any nation, leaving behind exports, natural resources and tourism. On the other hand, the productivity of the factors is expressed in the technical progress of the productive process (López, 2008). So given its importance, governments must strive to create an environment that supports improvements in productivity since it is one of the determinants of differentiation for regional social welfare (Oosterhaven & Broersma, 2007). Likewise, Porter (1998) mentions that a successful economy consists of striving productivity and innovation if competitiveness rules are established, for instance, intellectual protection property as well as antitrust laws fulfillment.

Therefore, a productive industrialization should be aligned to sustainability, although it directly considers one of the three dimensions by reducing total cost, it also spreads to others dimensions of the triple-bottom-line (Figure 1) such as minimizing environmental impact by productively using input resources, e.g. energy, manpower, or raw materials (Porter, 1995; Seidel et al, 2018). The United Nations suggests that industrialization has a multiplier positive effect on society as every job in the manufacturing sector generates 2.2 jobs in other sectors (United Nations, 2019). Thus, the manufacturing sector plays a strategic role, particularly in low-income countries (UNIDO, 2017). Thereby, industrialization is a strategic pathway to getting sustainability and facing the global issues explained below.

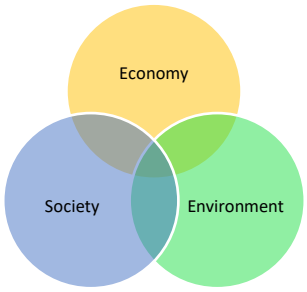

Figure 1. Triple Bottom Line

Notwithstanding, developing countries' economies are in danger by neoliberal supply markets affecting the context region, but especially the social and economic aspects of SME companies (Calderón & Sánchez, 2012). It is due to the low productivity rate and so it is likewise a lower representation of competitiveness of SME's manufacturing industry. Indeed, there is a lack of support for manufacturing SMEs from the Mexican state. This lack of support is determined to explain their poor economic growth vis-à-vis the one of large companies which enjoy facilities and technology, hence lowering their economical cost production and thus get a better competitive position in the domestic as well as in the global market, being this one of the main reasons for their establishment and operations in developing countries. Which it is the apparent case of the Mexican context economy, that it has evolved with the passing time of its market liberation process, it exacerbated since 1994 with the signature of the *North American Free Trade Agreement (NAFTA)* and the opening indiscriminate of the 'maquila' industry (Calderón & Sánchez, 2012) mostly with American capital. However, the advent of this agreement along with high Mexico´s dependence on the US economy (Luis-Pineda, 1979) has a large contribution to disarticulate the national value chain (Calderón & Sánchez, 2012), leaving Mexican factories out of competitiveness (Calderón & Sánchez, 2012) thanks to the facilities granted by Mexican government to foreign capital as opposed to the rest of Mexican SME, thus worsened social and income maldistribution and labor overexploitation all over the country (Luis-Pineda, 1999) likewise environmental spillover effects (Luis-Pineda, 2000, 2006). The underlying problem of this phenomenon relies on the neoliberalism economic strategy adoption of the NAFTA and the corresponding absence of the long-term economic policies to support economy key sectors such as agriculture and infant industry. However, the Mexican government created the phenomenon of quasi "enclave status" in the Maquila sector leaving aside through years SMEs. That strategy explains the low productivity prevailing among SMEs and a high mortality rate, and hence their low competitive position in the local and global market, despite that they are the domestic economy support. This industrial strategy corresponced with a lack of industrial policies which regard social and environmental implications which can be seen with the

continuous depletion and pollution of environmental resources, while social dimension is affected by the continued closure of SMEs. Given these extarnalities and socioeconomic costs though the last four decades, an urgent reorientation is requiered for a failed neoliberalism economic model (Luis-Pineda, 2008).

Hence, the focus of the current research paper is to propose a theoretical sustainable industrial development framework which provides a holistic perspective based on the systems thinking approach. According to Capra (2003), systems thinking is the most appropriate paradigm for rethinking socio-economic development as well as in tackling environmental challenges (Espinosa et al, 2006). First of all, concepts, literature review and the methodology of the research are presented as a rockbed for the investigation. Based on the following research question: 'Does Mexico have a sustainable industrial development strategy?'. In general, sustainability indicators are analyzed and an overview of sustainable development is depicted according to the economic, social and environmental dimensions of the Mexican context. Afterward, methods are presented for building a framework for sustainable industrial development, which supports the objectives of the 2030 agenda. This is discussed internally and compared with the methods presented. Finally, concluding remarks derived from this investigation are presented.

2. Analyzing the sustainable context

In the particular context of Mexico, by adopting weak sustainability through the NAFTA treaty, and analyzing the performance of the main indicators of sustainability, such as GDP, pollution emissions and unemployment. It can be inferred that the Mexican strategy is not providing the expected results, phenomenon which can be explained for many of the aforementioned reasons. On the one hand, in the case of the environment dimension, data obtained from National Institute of Ecology and Global Warming (INEEC) on greenhouse gases emissions shows that there is a high possibility, i.e. 98.3%, of continuing with the same growth rate, (see Figure 2). On the other hand, data information collected from the National Institute of Statistics, Geography, and Information (INEGI) indicates that the index of secondary sector GDP, which involves manufacturing activity, is compared with the labour productivity index and occupied population index (see Figure 3). Labour productivity decreased in 2012, even though GDP and occupied population indexes are correlated, but with negative productivity. Figure 4 shows that although there is an effective increase in employment which reduces the gap between formal and informal jobs, there are more informal jobs than formal ones.

Notwithstanding, the Mexican government, as pointed out before, has done a poor effort to stabilize this situation. On the one side, according to data from INEGI, it was reported that albeit there is 4.32% of GDP as an investment for ecological accounts, only 13.13% is for environmental protection. It means that 86.87% of the expenses are to address the depletion and degradation of the environment. This amount is totally superior around to 0.51% of GDP for research and experimental development, which is a science expense. Additionally, there is a tendency of decoupling between economy and environmental depletion, as the proportion of GDP went from 8.4% in 2003 to 4.6% in 2016. On the other side, the social dimension shows a contradiction, in this case, Figure 5 shows the performance development of the main social variables, despite GDP per capita and the human development index both showing a growing performance, GINI index maintained its performance resulting in prevailed inequality and a lack of social wellbeing.

The research question regarding whether Mexico has a sustainable framework, weak sustainability has achieved poorly performance in any dimension. As mentioned before, a short medium-term, with the economic dimension, there is not a good labour productivity indicator, it reaffirms with the labour increase. This rise does not make sense with low productivity inferring a deficient industrial strategy, confirming our above arguments. The social dimension shows an inequity of welfare, any sense of remunerations but also growing unemployment. Lastly but not least important, the environmental dimension, with high chances of growth rate in greenhouse gases emissions and the inadequate focus of investing in depletion and degradation of the environment instead of protecting it. In short, this neoliberal framework has not given to Mexico a favorable competitive position. From a theoretical point of view, this kind of unsustainable development would not flourish in any dimension and it would not offer a competitive advantage against neoliberal markets (Porter, 1995). Hence, despite the striving to manage sustainability, a holistic framework for sustainable and socially inclusive economic strategy should be implemented only by the state and not the private sector for developing nations to become feasible in any particular sector of their economies.

As previously referred, the strategy of industrial development is a viable choice for tackling bigger issues. However, the lack of it leads to inefficient productivity performance (Porter, 1998). Figure 3 showed a negative tendency of labour productivity in the Mexican manufacturing industry. Small and Medium Size Enterprises (SMEs) are the main

source of employment in Mexico, providing 78% of employment and representing 99.8% of established firms and contributing to 42% of GDP (Forbes México, 2018). An SME is defined based on several criteria, for instance, profits, cash flow or employed personnel. In this study, employed personnel is used as SMEs definition. This sector is very vulnerable as most SMEs die during the first three years after being established (El Financiero, 2015). Figure 6 shows the trend of mortality of Mexican SMEs in the first and fifth establishment years. The tendency is as long as more employees there are in the firm, the stronger it is; whereas vulnerable firms are those with few people in the fifth year.

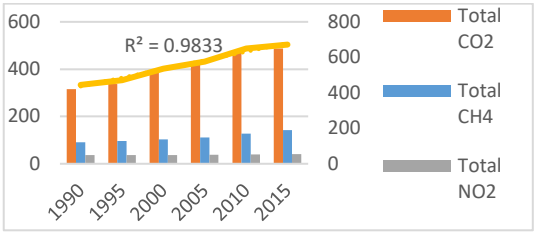

Figure 2. National greenhouse gases emissions in tons 1990-2015

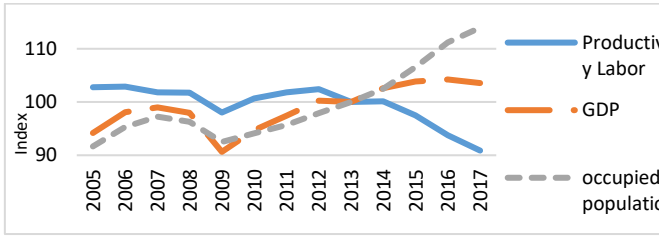

Figure 3. The global index of labour productivity in the economy

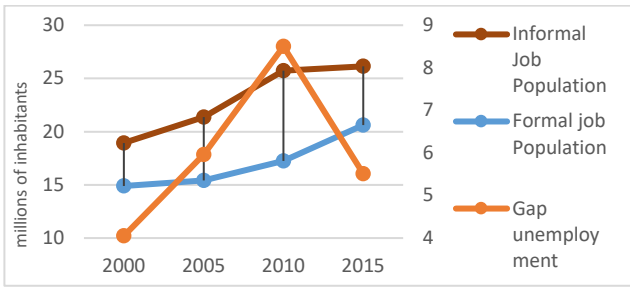

Figure 4. Employment in Mexico 2000-2015

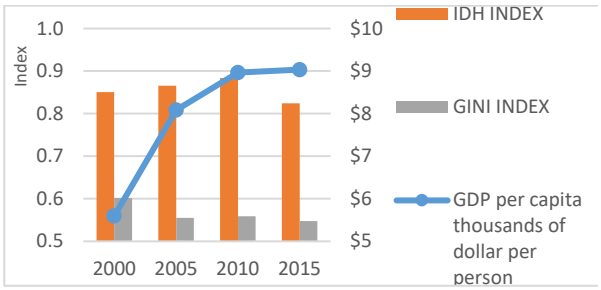

Figure 5. National social variables 2000-2015

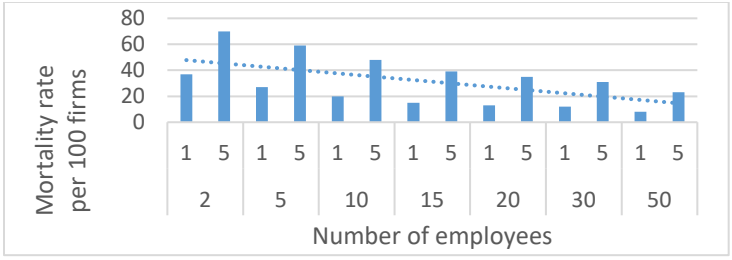

Figure 6. The mortality rate of Mexican SMEs in 1 and 5 years

The precedent discussion provides insights into the current scenario of SMEs Mexican firms, which depicts a vulnerable and not inclusive industrial strategy. Despite the government support through financing programs and encouraging SMEs by tax exemptions for setting up companies, all these economy stimuli and supports are not translated so far into a competitive position against big international companies. Mexican international economy has negative commercial balance and, it is the lowest among countries region (World Bank, 2019). Thereby industrial development must bear in mind that SMEs are a social and economic component of the problem situation and sustainability has to be inclusive in its wide definition. Thus, it should be inclusive for this kind of firms with the aim of facing unemployment and contribute to the development of sustainability in other dimensions or complementariness aspects. On the one hand, the establishment of a firm requires a great effort in terms of capital investment. Investors are not willing to waste time and money, as this is a considerable effort, and more for SMEs as they have limited resources, so profits must return back not later than the 3rd to 5th year. Notwithstanding, global competence occurs at every day and every moment, hence the odds of SMEs survival are biased to be unsustainable with the current industrial strategy by imports replacing, due to low competitiveness of national consumer goods, intermediate goods, and capital goods (Calderón & Sánchez, 2012). On the other hand, the odds of failure of the firm would be lowered

by adopting industry sustainable development with strong sustainability that regards long-term industry with the aim of balancing the triple bottom line. This strategy will protect the survival of SMEs companies. Therefore, the concept of sustainable development has the term socioeconomic strategy implicit in its definition, as it considers the future generations' needs, even for at least the next generation. Thereby, industrial sustainable development could be defined as "*the industry which meets the needs of the present by taking into account the environmental, social and economic dimensions for suitable development and balancing them without compromising the ability of future generations to meet their own needs"*.

The term "Strategy" comes from Darwin's' natural selection theory that suggests that evolution determines who survives and who is crowded out. Henderson (1989) compared this with businesses as in the jungle where two species cannot co-exist having the same lifestyle and necessities sooner or later the winner, with a superior advantage, defeat others. Porter, said in his article '*What is strategy'* that strategy is how an organization can be positioned in the market (Porter, 1996), by a competitive advantage which gives the firm a differentiation against rivals (Prahalad & Hamel, 1990). Nevertheless, differentiation could be seen from two sides; the weak side, that is an unsustainable differentiation; and, the strong side, that is a sustainable differentiation. On one side, a weak and unsustainable differentiation strategy is based on low market prices, which in most of the cases it creates a predator pattern among competitors that win the lowest price, but without profits. On the other side, a strong and sustainable strategy can be achieved in the market by possessing innovative services and products (Porter, 1996). This is the strategic seed for survival that develops a competitive advantage to any firm. But what gives strategy and what gives advantage to a firm. It depends on how the objectives are defined, whether their purpose of what firm generates value to customers or restriction of what a firm saves by operating efficiently, exploiting what creates greater value than other firms do is a strategy, and what firms can get more profits in operational efficiency is an advantage (Campbell & Alexander, 1997).

Moreover, one of the strategies that exploit competitive advantage of industrial development is industrial clusters. Porter (1996) mentioned that clusters offer a competitive advantage by boosting innovation and this is how policymakers should develop industrial policies (OECD, 2001) and to build differentiation in the strategy. Additionally, clusters are a viable hub to foster the inclusion of SMEs firms, that is achieved not just only by shearing the useful facilities but also because this type of industrial complex hub makes easier a collaborative focus, which could achieve beneficial sustainable practices (Foghani et al, 2017) such as industrial symbiosis or even the implementation of Industry 4.0 technologies (Götz & Jankowska, 2017).

3. Literature review

This section explains how the literature review was conducted, the methodology followed a logical sequence. It consisted of 4 phases. In the first phase, the search for publications was carried out in Scopus and JCR databases based on specifically defined keywords. The second phase consisted of performing a bibliometric analysis of 2000 research papers while in the third phase the identified papers were classified according to their relevance and summarized through a bibliometric analysis. Finally, with the selected information, the report of the literature review is presented in the next section. Publications search for Sustainable development with an Industrial strategy is a matter which is not in all the extension of the research known. However, to begin with, the literature review was useful to understand and establish how those fields are interconnected by conducting a bibliometric analysis. Based on relevant keywords of the latest 2000 research documents, in a time period from 2014 to 2017 such as sustainable, development, holistic solution and industrial cluster as Industrial Strategy were introduced in scientific database research.

The bibliometric analysis was performed with the support of the "VOS viewer" software, which is a useful tool for constructing and visualizing bibliometric networks. The analysis consisted of linkages based on citations, bibliographic coupling, co-citations, or co-authorship relations, offering functional information such as co-occurrence networks of important terms of the literature review (van Eck & Waltman, 2010). The analysis showed that the main countries which are researching these fields are China, Russia, the U.K., USA and most of EU countries. Moreover, among the main Journals, that they publish in sustainability development are: *Advanced Materials Research, Applied Mechanics and Materials, Journal of Computer Science* & *International Journal of Applied Business and Economic Research,* all of them are related to applied sciences; The second cluster, it includes the *Journal of Cleaner Production, Environmental Science and Pollution Research, Environmental Earth Science,* which are in the environmental problems' solution research area; Finally, the third cluster includes journals like *European Planning Studies, Journal*

of Economic Geography, Regional Studies, Industry, and Innovation & *Competitiveness Review*, which are journals of business sciences.

Authors' keyword cluster analysis by VOS viewer software is a tool for research tendency. First irrelevant input words of the network were removed, then 5 clusters network of the latest literature in industrial cluster and sustainable development were obtained. The most representative in the network is the industrial cluster network, which holds strong linkages with sustainable development, industrial symbiosis, industrial ecology, and sustainable and green park. Out of this cluster links with other valuable clusters such as economic growth, innovation and competence, and methodology of clusters. It highlights that Industry 4.0 as a node in the center of the map and it links with cluster, manufacturing, and networks, which It also links mainly with sustainability, innovation cluster, and knowledge.

Once the total network of the industrial cluster of sustainable development was determined, the information was purged to those research papers selected as part of the state-of-the-art literature. In that sense, from the data input, words which were not related to industrial cluster and sustainability (e.g. cluster computing, or keywords about bibliometric analysis, etc.) were deleted. Moreover, words with the same meaning as cluster were joined in the same group. Figure 7 shows the 5 clusters that resulted from the state-of-the-art literature selected by cluster analysis. Being the red cluster which holds more occurrences, its main node is innovation, also it links with cluster and competitive advantage and countries developing; Then, in the second node, it is the Industry 4.0 which is linked with smart factory and digitalization; The third cluster, sustainable development connects with industrial cluster and stakeholders engagement; Then, it is the green cluster; which links productivity and knowledge management; Finally, the purple cluster, it involves the industrial cluster with industrial symbiosis, labor productivity, and management. Based on these complex interconnections, it seems that industrial clusters and stakeholders' engagement are required for achieving sustainable development in developing countries. Developing countries need industrial clusters and labor productivity. Nevertheless, innovation is still the most important component.

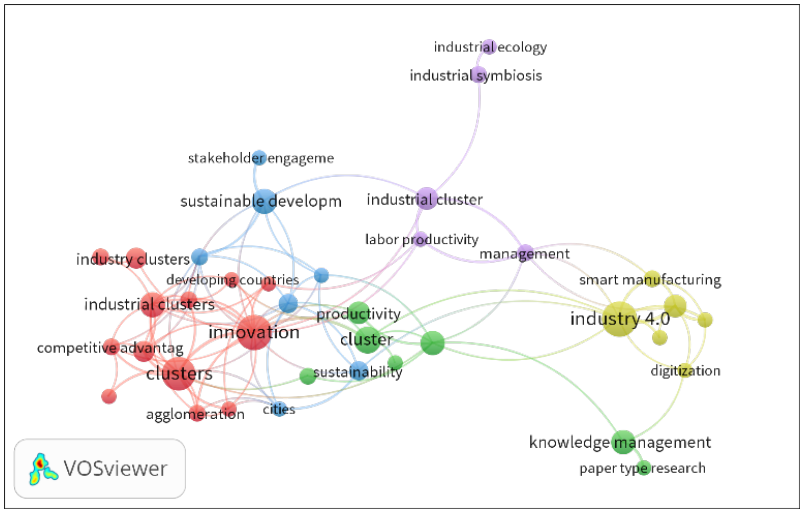

Figure 7. Industrial cluster sustainable development bibliometric analysis refined

4 State of the art literature

Once the tendency of sustainable industrial development is depicted in the previous section, which countries contribute with this investigation area as well as mains journals that publish this kind of research. In this section, the state-of-the-art literature is established. It consists of a review of the sustainable development in the industrial cluster discussion of the latest and most relevant research works. Although there is research in industrial sustainable development, there is a void of the linkage between industrial clusters and sustainable development. Romero et al developed similar research with green enterprise systems, as they regard the circular economy as the strategic component that leads to sustainability (Romero & Molina, 2012; Romero & Noran, 2015). Gülçin & Yagmur (2018) report that recent literature suggests sustainability science is a milestone for the green and competitiveness with an integrated, holistic and methodological approach. For instance, they mention that business can be lead by scientific

research on sustainability by adopting the strategy of meeting stakeholders expectations and aligning with the improvement of social assets and environmental assets for the next generations (Gülçin & Yagmur, 2018). Notwithstanding, a holistic point of view is missed in most of the literature review.

Nowadays knowledge management has become so far in the industrial sector, even though I 4.0 was launched in 2012 in Germany. I 4.0 has developed a great field of the labour market, so it is not just employment in the manufacturing sector created, but also the service sector has been growing for intense knowledge services (Götz & Jankowska, 2017). This sector is stronger than those in clusters of high technology manufacturing services (Temouri, 2012), inasmuch as its multiplier effect of industrial manufacturing jobs (United Nations, 2019). Being knowledge the most significant resources, and an endless one. Yu et al (2007) identified it as an asset, the same as earth, productive infrastructure and capital (Yu, Kim, & Kim, 2007). The difference between them is that knowledge in an endless resource that leads to the knowledge economy (Adler, 2001). However, knowledge needs a suitable environment, and a regional scope delimited for the organizations. Innovation leads to productivity, so the focus is on how to exploit this innovation in industrial clusters for sustainability is under the perspective of who creates innovation. According to Schumpeter (1944), an innovator can be anybody who exploits the economic cycle of the service or product into a market (Schumpeter, 1944) like a businessman or even a cluster manager who exploits the core competence of the cluster by the creation of cluster policies based on the life cycle (Pacheco-Vega, 2007).

Clusters have regional scope where intense knowledge can be fostered as this type of organizations fulfill with knowledge requirements, it accounts with the favorable environment with the infrastructure, and with a scope delimitated. Nonetheless, this environment must be suitable, Götz & Jankoska (2017) explained that I 4.0 is feasible in the industrial cluster environment (Götz & Jankowska, 2017). However, the cluster should be focused on being inclusive and embed SMEs firms too. Foghani et al (2017) under a collaborative approach and infrastructure sharing, mentioned that industrial symbiosis initiatives are created to be adopted by SMEs which are installed in a cluster to obtain environmental benefits, which is the key to achieve sustainable industrial development (Foghani et al, 2017). Other ways, cluster policymaker would be in the bias of regulating a weak social dimension economy. Daddi, in 2017 proposed a life cycle assessment method to measure the benefits of initiatives implemented and not implemented in the cluster's leading product. The results highlight the implemented initiatives that they achieved relevant benefits in sustainable development (Daddi et al, 2017). Cluster theory has been useful for the creation of industrial policies in the balance of economic development, as well as national success in the industrial ecosystem. Park et al (2016) in their work, mention a methodology for classifying high impact industries in the South Korean economy with variables that are significant for the performance of industrial clusters successful (Park et al, 2016). Therefore, an Industrial sustainable cluster should be inclusive and get a balanced economy for successful sustainability. Additionally, as long as it has an effective performance, the sustainability should correlate with the productivity (Di Giacinto et al, 2014), being productivity one of the main ingredients for prosperity and welfare of the region (Oosterhaven & Broersma, 2007; Porter, 1998), as well as intense innovation developed in the cluster. Thereby, Clusters theory is a vehicle that can be led to achieve sustainability, and being inclusive with SMEs and generates direct and indirect employment with a multiplier effect.

5 Methods

For the framework proposal, different theoretical methodologies are required for sustainable industrial development model with a system thinking approach. First, the use of systemic tools are necessary to understand the problem and all the different components that are involved in the framework (Kruger et al, 2018; Virapongse et al., 2016); also a system is a process that contains elements of input, output, agents that act as monitoring, control, and operation, as well as feedback that they are interrelated for a common purpose. It also contemplates the interaction of the components within the system and how it affects both the system that contains it (supra system) and the subsystems which are embedded into it. Figure 8 shows how systems thinking approach is represented, three systems are involved as a general sense of systems thinking. The supra systems can be seen as a superior system that a system in focus is performed (Aceves, 2015), additionally, supra system is also the environment which the system in focus is embedded as aforementioned (Virapongse et al, 2016). Then, the use of industrial clusters has been mentioned as a strategical option for industrial development, because it provides a strong competitive advantage and it creates innovative differentiation into the region, state or nation. Michael Porter, a leader in clusters and economics of competition, explained that economic maps are dominated by what he called clusters, which are critical masses in a place with an unusual competitive advantage in a particular field (Porter, 1998).

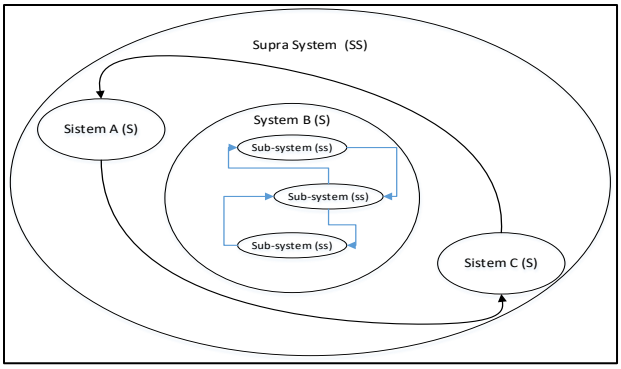

Figure 8. General model of open systems

Industrial cluster is defined as an array of industrial links and other prominent entities in the competition. This includes government, and other institutions such as universities, regulatory agencies, government advisors, vocational training providers, and trade associations. Barkley & Henry defined a cluster as a conglomeration of engaged firms of common sector production of goods or services which are vertically interconnected with complementary and specialized organizations such as financial services, government institutions, academical institutions even though row materials supplier (Barkley & Henry, 1997). Hernandez focuses on a special sector network as a cluster, however, it does not make sense that just elements are linked. Goméz et al highlighted the performance evaluation by balance scorecard because what it matters in the cluster is not the elements embedded, It is the effective performance of the whole as a system (Gómez, Otero, & Prieto, 2011). Generally, the cluster model is fostered in the triple helix model of innovation, which is used for policymakers, it follows the model shown in Figure 9.

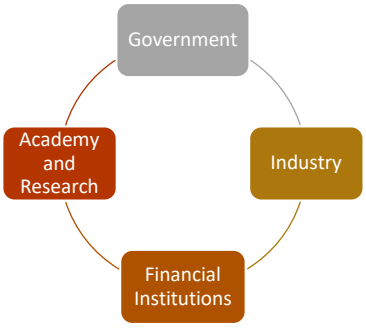

Figure 9. Industrial cluster framework (Gómez, 2011)

6 Results and Discussion

In this section the proposal is detailed. First, the strategy for sustainable industrial development is delineated as part of the model as the system in focus which is depicted in Figure 10, the framework for industrial sustainable development coupled with a socially inclusive approach. It is proposed to be the industrial cluster, as an organization who establish a strategy of differentiation with its core competence, as explained before. Cluster strategy must highlight a competitive advantage to get a strong sustainable strategy for competitive business context. In this regard, the supra-system is where the system in focus must evaluate its context. This asset of the triple line bottom is what determines the context of the system in focus embedded. Although in the framework the three spheres are separate, it does not mean that they are independent for each other. Hence, sustainability is the base of the industrial strategy with the aim of balancing the three dimensions for suitable development. For that reason, the industrial cluster as the system in focus is the way for properly balancing the development of the triple bottom line, likewise achieve affordable industrial development. Therefore, the industrial sustainable frame as being built based on the clusters theory and the systems thinking theory. Figure 10 shows how the parts of the triple helix are interconnected also with the financial sector as it is a component that exploits innovation. The cluster proposal frame is embedded in the sustainability context, thus, when a subsystem establishes into the cluster, it previously developed context analysis about main variables, such as how the region is wealthy or the average education grade of the people, or if row suppliers are close

to the establishment. However, the cluster organization is on duty of monitoring the sustainable context with sustainable metrics used by the UN is 17 SDGs and create policies that could balance sustainability.

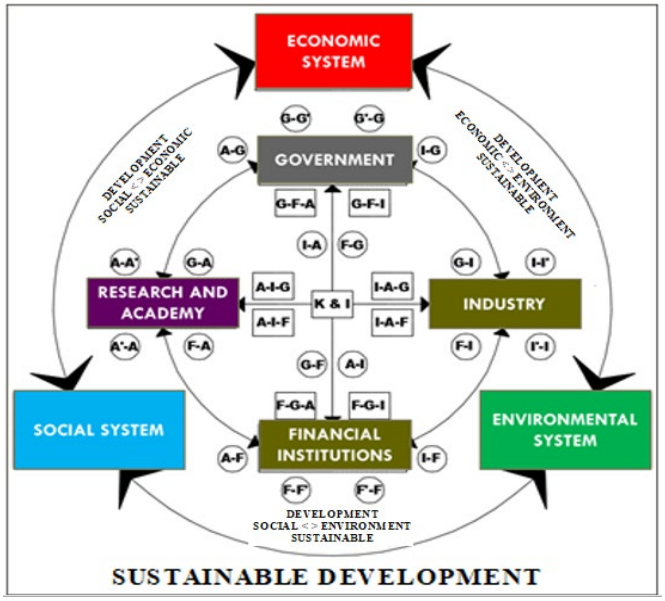

Figure 10 Industrial Sustainable Development Framework

In this sense, SMEs firms must put enough effort to delimit its affordable scope which can deal according to knowledge experience and where can they exploit their own strategy into the system in focus. However, the trade-off whether the organization is pursuing should bias to exploit innovative products or services with the knowledge of the organization, which it is the essence of the model placed into the center, of what the purpose of the company was made, and sustain a competitive advantage. Other ways, the unsustainable focus of the comparative advantage conveys to depletion of natural resources of the region or lowering prices. On the other hand, the cluster considers all the sub-systems which are involved in each part of the triple helix. Although is important to highlight the systems embedded, the key of productivity is how knowledge and innovation are exploited in the linkages. The frame is building in a holistic point of view, by systems thinking, which it consists of three main components; the supra-system, in this level the systems can be seen as the three pillars of sustainability context; the systems are those which oversee making decisions for balancing the supra-system; finally, sub-systems are those which operate in the cluster as an element. Then, once the organization highlights its core competence which gives competitive advantage with innovative differentiation, sustainable methodologies can be implemented for the subsystems embedded into the system in focus. Systems have recursively property so the organization can be seen with subsystems as firms (I), academic units (A), government (G), and financial institutions (F). In general, subsystems derivate from interconnections of systems linkages, even though mixed subsystems linked with 2 or more subsystems of aforementioned units i.e. industry with the government (I-G), industry with the academy (I-A), industry with academy and government (I-A-G).

In summary, the *industrial sustainable development is the establishment of a suitable strategic development for industrialization by decisionmakers, with stakeholder's engagement and approval, and perform it in different levels of the system in the industrial region and, balancing the triple line bottom with sustainable guidelines and tools*. Here some tools for decisionmaker were mentioned such as sustainable BSC or Porter values chain which they were combined with sustainable guidelines. Most of them with the firm's scope focus level. This proposal is a regional tool for improving the environment of the region aimed at industrial policymakers as team innovators who represent to stakeholders' interests, and welfare of society into it and properly growth economy. In addition, some variants for each recursive level must be analyzed i. e. firms, industrial parks, and industrial clusters organization. It depends on how stakeholder have defined their scope and the maturity of the local sustainable region that the industrial management will manage. For instance, Figure 11 shows that according to how the organizational industry is clustered, the market that the industrial organization would competitive aspire. At the end of industrial development, there is an interconnection between cluster whit the affordable national and international market could get.

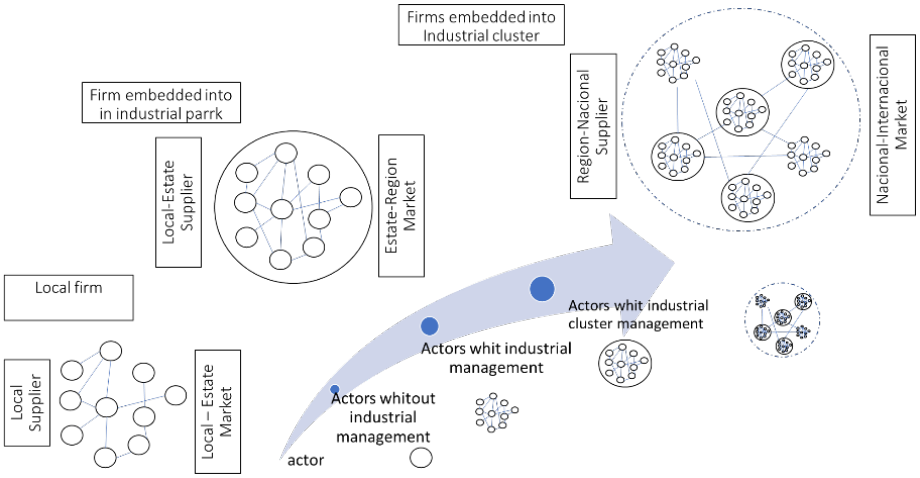

Figure 11. Industrial management systems

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